



EXPLORE FLIGHT

WE'RE WITH YOU WHEN YOU FLY

Data and Reasoning Fabric (DRF)
Wildfire Detection Field Test with the California Civil Air Patrol (CAP)

January 2023

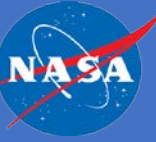
NASA Aeronautics Research Mission Directorate (ARMD)
Transformative Aeronautics Concepts Program (TACP)
Convergent Aeronautics Solutions (CAS) Project

DRF is envisioned to provide access to data and AI-driven decision support tools to:

- Provide transportation for people and cargo to places previously not served or underserved by aviation.
- Enable increased flights in congested urban areas
- Support the growth of AAM operations that depend on accurate, reliable, and current data



Wildfire Detection Field Test



The DRF team in collaboration with the California Civil Air Patrol (CAP), executed a field test that identified a preliminary set of data and reasoning service areas that can be enabled and enhanced by DRF to potentially bring forth improved accuracy and reduced latency to CAP's mission critical decision making, in wildfire detection.

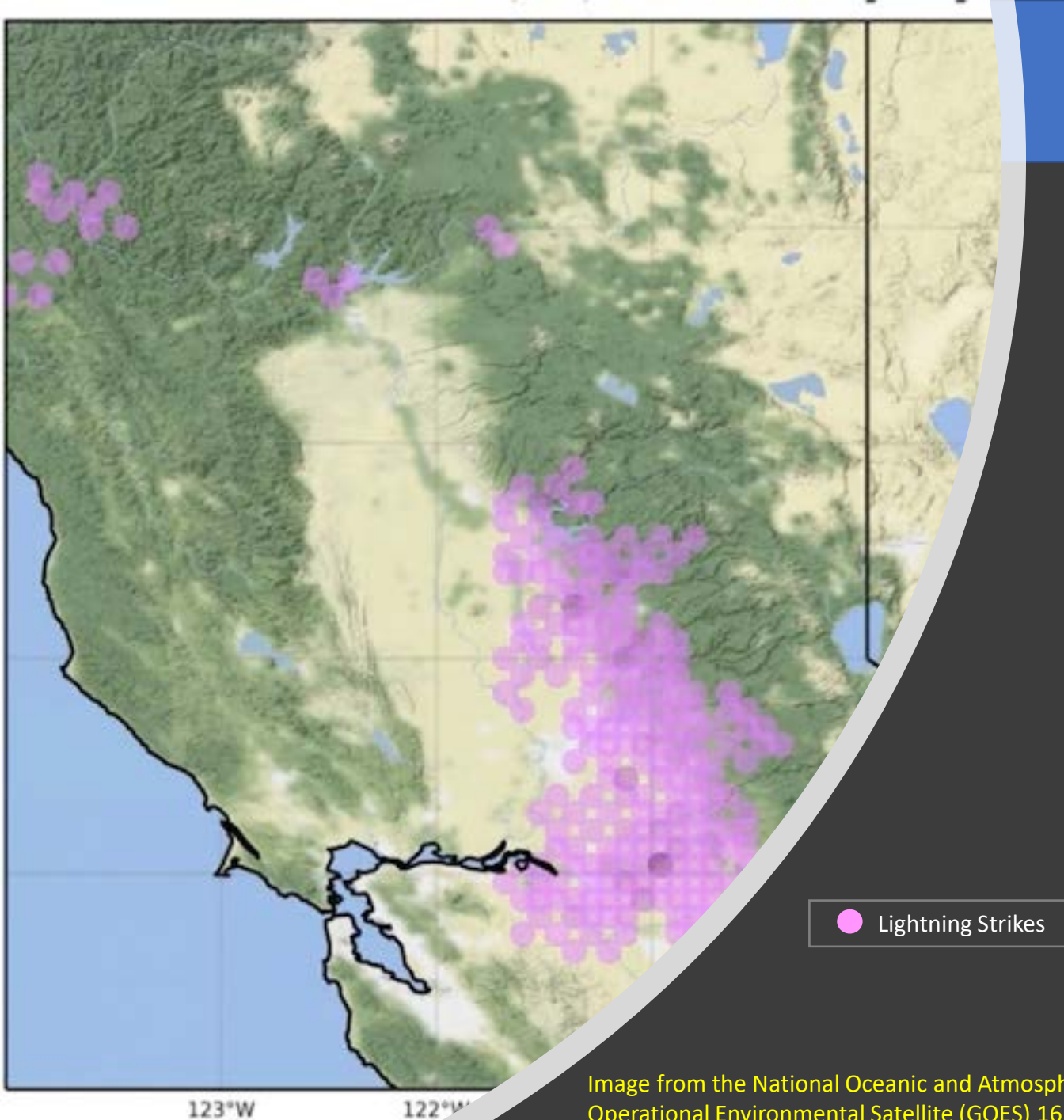


Image from the National Oceanic and Atmospheric Administration (NOAA) Geostationary Operational Environmental Satellite (GOES) 16, a geostationary spacecraft



- CAP's Air Mobility Missions:

- CAP operates manned and unmanned flights, in coordination with CalFire and other government entities in the state of California, to collect aerial imagery data of regions sustaining recent lightning strikes and, therefore, are more likely to have a fire started there.
- Additionally, CAP provides mission support in search and rescue operations, and cadet training programs.

- Technology Fit for NASA DRF:

- DRF is based on an open foundational ecosystem of data and reasoning exchange between systems that must seamlessly interplay to manage complex and/or dense airspace operations.

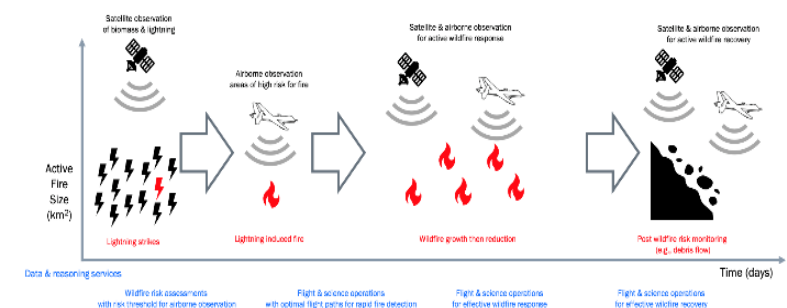
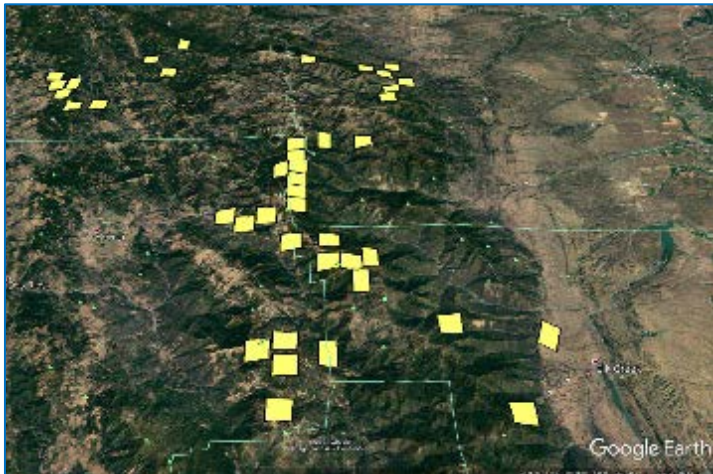
- Current Pain Points and Bottlenecks in CAP Missions:

- Timely access to holistic data for mission-specific decision making
- Availability of ready-to-use data processing services for actionable information gathering
- Mission framework structuring and automation



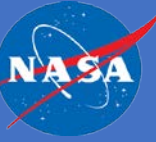
NASA/DRF – CAP/Wildfire Collaboration:

- The California Wing of CAP and the DRF Data Service Team came together during the Fall of 2020.
- The NASA DRF Team gathered an understanding of CAP's operational process flow for their wildfire reconnaissance missions
- In collaboration with CAP, the NASA DRF team is identifying a preliminary set of data and reasoning service areas that can be enabled/enhanced by DRF to potentially bring forth improved accuracy and reduced latency to CAP's mission critical decision making.



Example services may include target package down-selector, trend analyzer, global situational awareness builder etc.

DRF and CAP Support for Wildfire Detection



Registration of Data & Reasoning Services



Registration of Users & Service Discovery



Simulated Lightning Strike



Identification of Fly Target Areas



Identification of Flight Trajectories



Leveraging weather and environmental data and decision support reasoning services to plan wildfire detection missions

Onboarding data & reasoning services

Enabling data & reasoning service discovery

Access weather data services

Interoperable access to diverse data to support reasoning service

Leveraging multiple reasoning services for decision support

Enabling Data & Reasoning Service Discovery



Leverage DRF to discover the data or reasoning (AI-driven decision support) services to select region for wildfire detection.

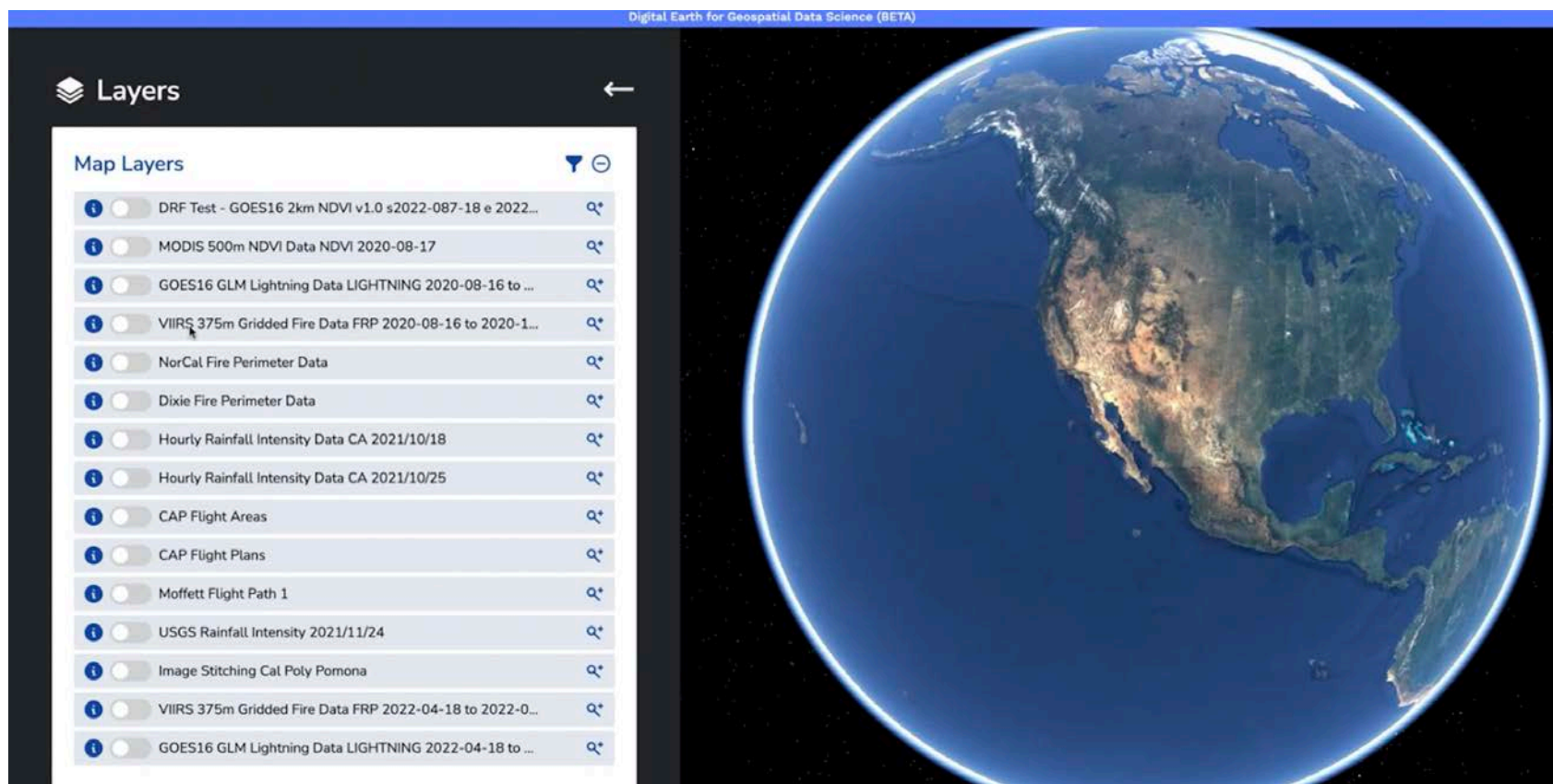


Image from from the National Oceanic and Atmospheric Administration (NOAA) Geostationary Operational Environmental Satellite (GOES) 16, a geostationary spacecraft and Universities Space Research Association (USRA)

Leverage DRF to access weather services, such as lightning strike and terrain data, to select target areas for wildfire detection

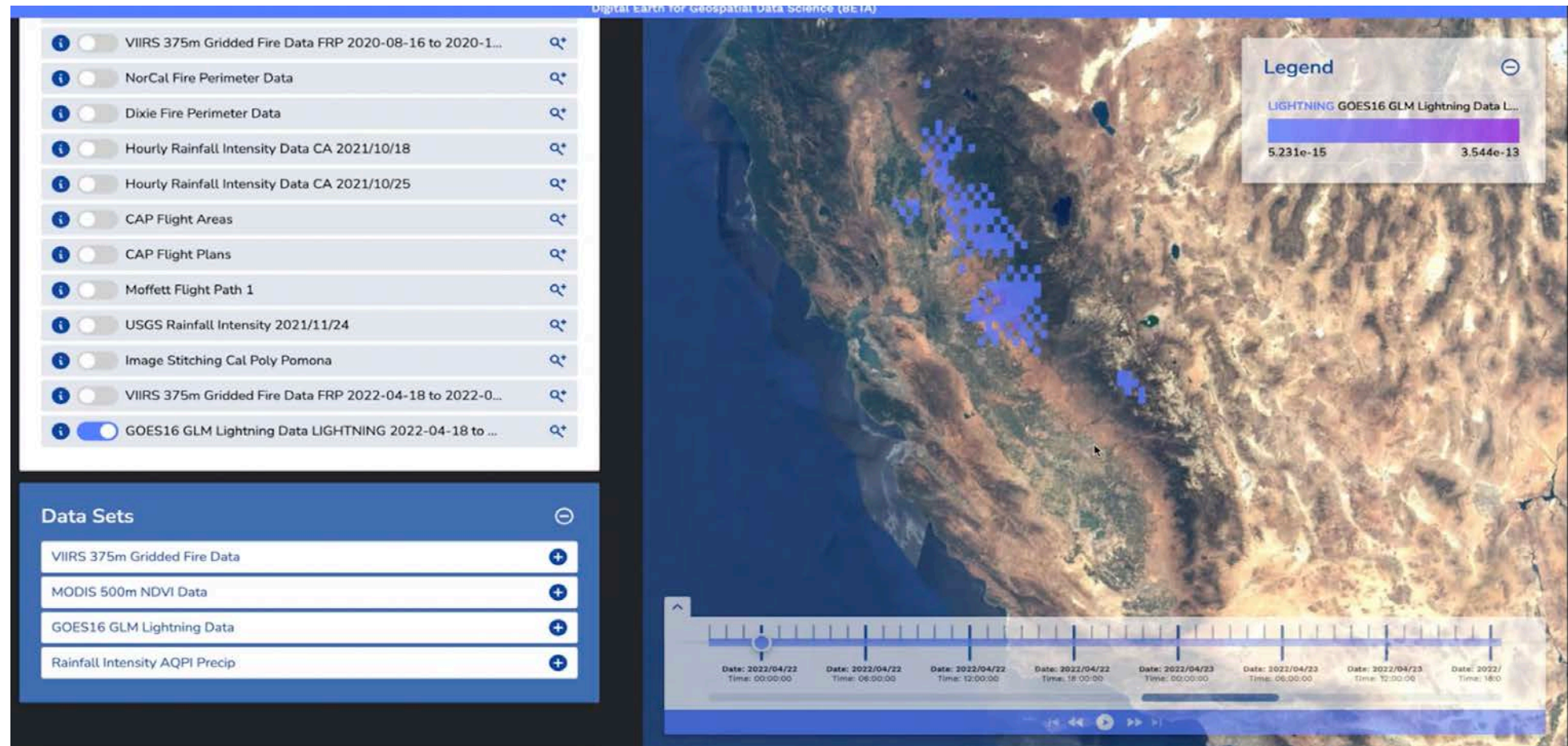


Image from from the National Oceanic and Atmospheric Administration (NOAA) Geostationary Operational Environmental Satellite (GOES) 16, a geostationary spacecraft and Universities Space Research Association (USRA)

Identification of Fly Target Areas

Interoperable access to
diverse data to support target
selection reasoning service



LAUNCH LOCATION (LAT/LON)

MISSION TIME (MINS)

SELECT LOCATION	LOCATION ID	SET PRIORITY	SERVICE TIME (SECS)	REMAINING BATTERY (%)
<input checked="" type="checkbox"/>	1	1	40	0
<input checked="" type="checkbox"/>	2	1	40	0
<input checked="" type="checkbox"/>	3	1	40	0
<input checked="" type="checkbox"/>	4	1	40	0
<input checked="" type="checkbox"/>	5	1	40	0
<input checked="" type="checkbox"/>	6	1	40	0
<input checked="" type="checkbox"/>	7	1	40	0
<input checked="" type="checkbox"/>	8	1	40	0
<input checked="" type="checkbox"/>	9	1	40	0

OK

Identification of Flight Trajectories

Leveraging multiple reasoning services for decision support to select flight path for wildfire detection



Advanced Air Mobility (AAM) with DRF

- To achieve an inclusive AAM system, we must get autonomy and data management and access to decision support right
 - The new entrants will require safe and efficient operations
 - There will be requirements to migrate to comprehensive autonomy, better data links and distributed information systems
 - Operations in real time as needed
- Access to data and AI-driven decision support tools will be required to expand AAM



